

Chapter 2

STATUS OF STREAM BIOASSESSMENT ACTIVITIES IN CALIFORNIA

The information presented herein does not constitute a comprehensive overview of all bioassessment activities conducted in California. The information required to complete this section was requested on a volunteer basis; however, only a small fraction of the entities and agencies conducting bioassessments in California responded with sufficient information. On the other hand, the information we collected is indeed representative of a wide range of rigor and interdisciplinary programs, and consequently, it provides a good overall picture of the nature of bioassessment programs throughout California. For more detailed information on specific programs summarized in this section, see Appendix A.

Prior to the 1990's, bioassessment programs were few and far between in California. The only well established long-term bioassessment program in California at this time was that designed and implemented by the California Department of Water Resources (DWR) Northern District. The DWR began collecting bioassessment data circa 1975 and has sampled approximately 100 sites per year. Other than the DWR program, there has been little or no documented information about broad-scale bioassessment programs in California prior to 1992. Historically, the use of bioassessment data in water quality program decisions and management actions has been virtually non-existent. California's State Water Resource Control Board (SWRCB) and RWQCBs have relied primarily on chemical and toxicological information to support management actions.

In the early- to mid-nineties, however, California saw a handful of new bioassessment programs develop across the state. In 1992, the United States Geologic Survey (USGS) began implementation of the first of a series of three broad-scale bioassessment programs in California as part of the National Water Quality Assessment (NAWQA) Program. Also in 1992, the California Department of Fish and Game's Aquatic Bioassessment Laboratory (ABL) began conducting projects covering many different applications of bioassessment throughout the state. Then in 1993, ABL distributed a set of standard protocols for assessing biological and physical conditions of wadeable streams, the California Stream Bioassessment Procedure (CSBP), which is a regional adaptation of the USEPA Rapid Bioassessment Protocols. In 1994, the United States Environmental Protection Agency (USEPA) initiated a broad-scale Regional Environmental Monitoring and Assessment Program (REMAP) bioassessment project in the Central Valley to test the applicability of the national Environmental Monitoring and Assessment Program (EMAP) approach to answer questions about ecological conditions at regional and local scales. In 1995, the Lahontan Regional Water Quality Control Board (RWQCB) began a bioassessment program to monitor the success of remediation efforts at the abandoned Leviathan Mine.

By the year 2000, many had discovered the benefits of conducting bioassessments, and bioassessment programs began sprouting up all over the state, ranging from state agencies to watershed organizations and even volunteer monitoring groups. Coordination among the various groups and agencies collecting bioassessment data began in earnest over the past two years. Consequently, a statewide approach to bioassessment has identified a need, so that differences in results reflect ecological differences, not just differences in methodologies.

2.1 The California Aquatic Bioassessment Workgroup (CABW)

In 1994, DFG, in cooperation with the State Water Resources Control Board and with funding from the U.S. EPA, established the California Aquatic Bioassessment Workgroup (CABW) as a forum for researchers, agency personnel and private consultants working in the field of freshwater biological assessment to communicate and exchange information regarding their work. The three-day meetings provided an opportunity for various state and federal agencies conducting bioassessments in California to update the group on their activities. The State and Regional Boards also discussed ways that they envisioned using bioassessment data in their regulation of water quality. At the first meeting, held in September of 1994, DFG set up a workgroup to review the 1993 edition of the California Stream Bioassessment Procedure (CSBP), assembled a steering committee to produce a Statement of Purpose for the CABW and established an on-going workgroup for defining reference stream criteria.

By the second meeting in 1995, the revisions to the CSBP for wadeable streams and the Statement of Purpose formulated by the steering committee were finalized. The Statement of Purpose outlined four specific objectives of the CABW:

1. Develop consistent, sound methodological approaches to aquatic bioassessment by (a) defining and testing sets of procedures for sampling aquatic communities; (b) establishing reference conditions; (c) developing quality assurance and quality control procedures; and (d) advancing analytical procedures, such as effective use of appropriate metrics and indices.
2. Provide a mentoring and support network concerning technical and professional issues for workgroup participants. The workgroup members envisioned frequent bioassessment workshop where techniques and issues could be presented and participants could network with each other.
3. Facilitate communication by (a) enhancing interagency cooperation; (b) providing an electronics communication platform; (c) disseminating pertinent technical literature; and (d) promoting discussion of findings and bioassessment issues.
4. Promote the incorporation of usable data gathered by volunteer monitoring groups into agency bioassessment programs.

The California Aquatic Macroinvertebrate Laboratory Network (CAMLnet) was formed in 1995 as a workgroup of the CABW with two missions: 1) to provide a forum for sharing technical expertise and experience among laboratories performing bioassessments in California and 2) to serve as a technical advisory body to the CABW and the California State Bioassessment Procedure (CSBP). Although CAMLnet was created as an advisory group to the CABW, its coverage includes all issues related to freshwater macroinvertebrate taxonomy and laboratory procedures. CAMLnet membership consists of private laboratories, tribal, state and federal agencies and university personnel.

One of CAMLnet's major roles is to standardize the levels of standard taxonomic effort used in bioassessments using the CSBP. CAMLnet produced the first edition of the CAMLnet List of Standard Taxonomic Effort (LSTE) in 1999. CAMLnet also sponsors taxonomic workshops to exchange taxonomic expertise, improve taxonomic precision and increase standardization for difficult taxonomic groups.

The objective of the 1996 meeting was to formulate the process for developing biocriteria in California. A workgroup was formed to address the regulatory need for California to have a biocriteria program and at the end of the meeting, an informal discussion concluded that implementation of biocriteria would probably be long in coming and that it most certainly would come after all the supporting science was in place. Also at that meeting, DFG distributed the 1996 version of CSBP, introduced, for review, the CSBP for Citizen Monitors and announced that the CABW web site was up and running.

The CABW continued its annual meetings from 1997 through 1999 providing a forum for updating the attendees on the status of bioassessment in California and presenting examples of bioassessment projects throughout the United States and even Australia. New workgroups were established and others were terminated. The reference stream criteria workgroup ended after three years because the work was dependent on volunteer efforts that were too difficult to support. Many other workgroups met for one or two years to review or gather input for the following issues:

- Identification of funding sources and programs which could promote biocriteria development;
- Review and finalization of revisions of Laboratory and QA/QC Procedures for the 1999 version of the CSBP;
- Formulation of an electronic data processing and storage platform;
- Technical support to citizen monitors and a bioassessment procedure for educational purposes;
- Use of bioassessment in water regulation and FERC re-licensing;
- Use of bioassessment in the California's Stormwater Management Program;
- Use of bioassessment in TMDL development and implementation;
- Assessment of the potential for applying the Rivers Invertebrate Prediction and Classification System (RIVPACS) model to California bioassessment data.

By the year 2000, many bioassessment programs supported by the State and Regional Boards and other water resource agencies needed a forum to present and gather input on their data and interpretation of the results. To accommodate this, DFG changed the seventh and eighth CABW meeting from a three-day workgroup session to two-day platform presentation and panel discussion format. This format was successful in bringing more state and national bioassessment programs to the attention of an expanding audience and providing examples of how bioassessment data was being used in various programs. For the 2002 CABW meeting, DFG returned to the three-day workgroup format consisting of the following sessions:

- The EPA's Environmental Monitoring Program (EMAP) in California and How Water Resource Managers Can Use the Information

- The Use of Bioassessment in Developing and Implementing Total Maximum Daily Loads (TMDLs)
- Developing Biocriteria and How Water Resource Managers Can Use an Index of Biological Integrity (IBI)
- Diagnosing Aquatic Resource Impairment Using Chemical, Toxicological, Physical and Biological Tools

Early in the history of the CABW, the Steering Committee identified the need for professional training in bioassessment. In response, the Sustainable Land Stewardship Institute International (SLSII) adapted a very successful training program for citizen monitors into two three-day workshops aimed at a professional audience. Since 1996, more than three hundred water resource professionals and monitoring coordinators have had extensive training on the concepts of bioassessment in California, use of the CSBP, how to contract public and private laboratories to process bioassessment samples, and how to interpret bioassessment data. The annual CABW meetings and the SLSII bioassessment trainings have been the core elements responsible for introducing the concepts of biocriteria and standardized bioassessment procedures in California.

2.2 Federal Programs

Several federal agencies are currently collecting bioassessment data throughout the State, most of which are large-scale programs. Federal agencies currently collecting bioassessment data are the US Geologic Survey (USGS), the US Environmental Protection Agency (USEPA), the US Forest Service (USFS), and the Bureau of Land Management (BLM). Since all of the agencies collect bioassessment data using candidate methods and are covered more thoroughly in Chapter 3, limited discussion will be afforded to those programs in this section.

Beginning in 1992, USGS has conducted two basin-scale bioassessment projects, and is in the process of conducting a third, as part of the National Water Quality (NAWQA) Program. The San Joaquin-Tulare Basin project was completed in 1995 and the Sacramento Basin Project was completed in 1998. The Santa Ana Basin Project began in 1998 and was not yet completed at the time this report was written (2002).

The US Environmental Protection Agency (USEPA) has conducted a broad-scale bioassessment project throughout the Central Valley as part of their Regional Environmental Monitoring and Assessment Program (REMAP). Biological data were collected for two years (1994-1995) at approximately 87 sites in the Sacramento-San Joaquin River Valley to test the applicability of the nationwide Environmental Monitoring and Assessment Program (EMAP) approach to answering questions about ecological conditions at regional and local scales. USEPA is also collecting bioassessment data in California as part of the EMAP Western Surface Water pilot study, which is a five-year research and monitoring project to assess the ecological condition of streams and rivers throughout the Western U.S. However, because this project has only recently begun and is still several years away from completion, more effort was focused on the completed REMAP study in this report.

The US Forest Service (USFS) has conducted numerous small-scale bioassessment studies throughout the State in the past; however, virtually all bioassessment monitoring has been for

specific projects, with little regional perspective or application. Furthermore, different regional branches often conducted bioassessments using different sampling methods and were not coordinated with other branches. It was not until 2000 that they began a more consistent, standardized, scientifically credible, region-wide effort to address region-wide issues, such as watershed restoration.

2.3 State Agency Programs

Several state agencies have begun to utilize macroinvertebrate bioassessments for a variety of purposes. The California Department of Fish and Game's (CDFG) Aquatic Bioassessment Laboratory (ABL) utilizes bioassessment data in their Enforcement Case Program to measure deleterious effects to biological communities resulting from pollution events. Furthermore, ABL initiates bioassessments for numerous reasons when conducting special studies, such as the Consumnes River Watershed study and the Martinez Creek study. This program will be discussed in much greater detail in Chapter 3.

The State Water Resources Control Board utilizes bioassessment as part of their Federal Energy Regulatory Commission (FERC) Hydroelectric Relicensing and Repair Program to help determine compliance with the Clean Water Act and to assess water quality impacts. Under this program, licensees are requested to use rapid bioassessment to help determine impacts to water quality and beneficial uses. Furthermore, they use bioassessments in conjunction with water quality monitoring to determine the impacts of hydroelectric repair projects.

The California Department of Parks and Recreation has implemented bioassessment as part of their Natural Resources Inventory, Monitoring, and Assessment Program (IMAP) to assess water quality and the condition of aquatic ecosystems in state parks. Additionally, the project aims to assess the bioassessment findings in relation to steelhead and other aquatic organisms inhabiting these streams.

The Department of Water Resources (DWR) has been conducting bioassessments since 1975 as part of their responsibility per the California Water Code to determine the quality of the waters of the State. The primary objectives of their program are to provide long-term background information, to determine water quality based on types and abundance of individual species, and to monitor impact assessment and FERC relicensing of major DWR hydroelectric facilities.

2.4 State and Regional Water Quality Control Board Programs

Several Regional Water Quality Control Boards (RWQCB) have recently implemented bioassessment programs to assess the condition of streams within their jurisdiction. Only in its second year, the San Francisco Bay RWQCB (Region 2) has already collected bioassessment data from 72 sites throughout six watersheds. The primary purpose of this program is to establish screening-level ambient biological and physical monitoring in the region's streams along with chemical and toxicity monitoring, as well as establish reference conditions. Secondary purposes include impact characterization, pre- and post-project characterization, and support of regional efforts at habitat classification.

Since 1998, the Central Coast RWQCB (Region 3) has been using bioassessment as part of their Central Coast Ambient Monitoring Program (CCAMP). In this program, bioassessment is used in conjunction with other water quality monitoring approaches to characterize all watersheds throughout the region and to evaluate the effectiveness of best management practices (BMPs) in the Morro Bay Watershed.

The Los Angeles RWQCB (Region 4) is currently funding a bioassessment project to determine the biological health of streams relative to land use in three watersheds (Malibu, Calleguas, and Santa Clara). The University of California Los Angeles (UCLA) is conducting the project, which began in the Fall 2001 sampling season. Furthermore, Region 4 recently initiated a bioassessment program as part of the Surface Water Ambient Monitoring Program (SWAMP), whereby both site-specific monitoring goals and the regional monitoring goals have been integrated into one ambient monitoring program. The information gathered will be used to identify impaired beneficial uses, as well as potentially in the development of an index of biological integrity.

The Central Valley RWQCB - Sacramento (Region 5) began their stream bioassessment program in Fall 2000. The goal of this project is to provide a first step at identification of aquatic life stressors and associated development of ecological indicators in agriculturally dominated and effluent dominated waterbodies in the Central Valley.

Starting in 1995, the Lahontan RWQCB (Region 6) began collecting stream bioassessment data in order to monitor the success of the remediation efforts at the abandoned Leviathan Mine. In 1999, a more concerted, region-wide bioassessment program was implemented: 1) to establish regional reference conditions, 2) to assess the impacts of human activities on the biological integrity of streams and rivers, 3) to evaluate the effectiveness of restoration efforts, BMP implementation, and permit conditions, and 4) to develop narrative and numeric biocriteria. The primary objective of this program is to incorporate consideration of biological integrity into the many regulatory and watershed management functions of the Lahontan RWQCB. This program will be discussed in much further detail in Chapter 3.

The San Diego RWQCB (Region 9) initiated a bioassessment program in 1998 to support the ambient monitoring program and to provide baseline data on the benthic macroinvertebrate community in regional streams. The bioassessment program will evaluate the biological and physical integrity of targeted inland surface waters, and is designed to meet an obligation to assess the condition of the Region's waters relative to the attainment of water quality standards.

It should be noted that the North Coast RWQCB (Region 1) have also been conducting stream bioassessments throughout their region. However, since they chose not to participate in our report, we are unable to provide any details about their program.

2.5 Countywide Programs

Many counties have also begun utilizing bioassessments in their Clean Water Plans. The Alameda Countywide Clean Water Program (ACCWP) began using bioassessments in 1998 to support stormwater management activities in Alameda County creeks. The Alameda County

Flood Control and Water Conservation District sponsors the program, which focuses on providing watershed characterization, assessment, and trend monitoring data, and on ensuring compliance with NPDES permit requirements.

The Contra Costa Monitoring and Assessment Plan (CCMAP) began using bioassessment in 2001 as part of a long-term strategy that builds on previous special studies and data collection efforts. CCMAP is designed to assess the conditions of watersheds, water bodies, and water quality within Contra Costa County. CCMAP entails further characterization of watersheds and sub-watersheds, and the development of strategically placed monitoring stations where rapid bioassessment data can provide a valuable screening device to determine where water quality and watershed health are degraded or have the potential for degradation.

The Marin County Department of Public Works incorporated bioassessment in the form of a macroinvertebrate survey into the Marin County Stormwater Pollution Prevention Program in 1999. The primary focus of this survey is to provide data on watershed characterization, assessment, and trend monitoring.

The Ventura County Flood Control Department (VCFCD) began conducting bioassessment after the Regional Board inserted the requirement in the NPDES MS4 permit during the permit renewal. The County has created a program under consultation with CDFG and has conducted bioassessment at 12-14 stations throughout the Ventura River Watershed, which is much more extensive than the requirements placed in the MS4 permit. The main purpose of this program is to assess the biological condition of the Ventura County Watershed and to ensure compliance with NPDES permit requirements.

2.6 Municipal Programs

Both the City of San Jose and the City of San Diego began conducting stream bioassessments to assess water quality. The City of San Jose uses bioassessment data to establish a baseline condition of the benthic macroinvertebrate community prior to the release of recycled water into streams. The City of San Diego uses bioassessment data to assist the city's Metropolitan Wastewater and Storm Water Departments in assessing water quality. Furthermore, they also use bioassessment data to determine biological recovery after toxic events, such as sewage spills, and to assist other agencies with their bioassessment needs.

2.7 Watershed Organization Programs

There are over 100 watershed organizations located throughout the state of California, many of which incorporate bioassessments into their watershed protection/restoration strategies. While summarizing each individual program is not possible, we chose to include a few representative examples to indicate how and why bioassessments are being used by watershed organizations.

The Feather River Watershed Monitoring Program (FRWMP) began conducting bioassessments in 1999 with the purpose of obtaining and making available baseline and continuing data from which trends in watershed health can be measured. The FRWMP is a project of the Feather

River Coordinated Resource Management Group, which is a consortium of 21 public and private agencies and land management entities.

The Friends of Deer Creek began collecting bioassessment data in 2000 as part of the Deer Creek Watershed Bioassessment Program. The primary focus of this program is to assess the ambient condition of the watershed and to evaluate stream restoration efforts. Additionally, they provide data to community members and decision makers in order to support watershed protection and restoration.

The McCloud River Preserve began collecting bioassessment data in 1998 at the citizen level, and then in 1999 at the professional level. The primary focus of the program is to document and analyze the aquatic macroinvertebrate community in the McCloud River and to use the information in conjunction with on-going water quality research to provide a baseline review of the state of aquatic resources within the watershed.

The Reeds Creek/Red Bank Creek Watershed Program is a citizen-based bioassessment program overseen by the Tehama County Resource Conservation District. The program focuses on determining the long-term trends in watershed conditions for Reeds and Red Bank Creeks through volunteer collected macroinvertebrate data. Both volunteers and students have been collecting bioassessment data since 2001.

The Upper Putah Creek Watershed Management Program began collecting bioassessment data in 2000, which is funded by a 319(h) grant administered by the Placer County Resource Conservation District. The program focuses on training and supervising citizen volunteers to monitor impacts to Upper Putah Creek and its tributaries and translate findings into restoration projects for the Stewardship to implement.

The South Yuba River Citizens' League began collecting bioassessment data in 2001 in order to assess ambient water quality throughout the Yuba River Watershed. The program trains volunteers to collect bioassessment data, which are used to educate community members and to provide data to decision makers for supporting watershed protection and restoration.

2.8 Tribal Programs

Several Native American Tribes across the State have recently begun conducting their own bioassessment programs to monitor water quality on Tribal lands. Both the Hoopa Tribe and the Yurok Tribe utilize rapid bioassessments as part of their ambient water quality monitoring programs. The Pit River Tribe, Smith River Rancheria, and several other tribes are still in the development phase of their water quality programs but plan to include bioassessment as part of their monitoring strategies in the near future.

2.9 Other Programs

There are various other programs/projects throughout California that utilize bioassessments, most of which are research oriented. For example, the Santa Clara Valley Project collected macroinvertebrate data from 14 streams in the Santa Clara Valley from May 1997 to October

1998. The primary focus of the project was to establish the relationships between benthic macroinvertebrate assemblage composition and physical and chemical factors associated with an urban environmental setting. Furthermore, the project aimed to develop a baseline data set representing the distribution of benthic macroinvertebrates in the Santa Clara Valley, which can also be used for evaluating the level of field and laboratory effort needed to conduct bioassessments.

Additionally, several universities (i.e., UC Davis, UC Berkeley, UC Santa Barbara, UC Los Angeles) have all been involved in conducting various bioassessment projects. The scope of these projects ranges from students' theses to private consulting projects for Regional Boards. For example, the Tahoe Research Group, which is a cooperative between UC Davis and The Tahoe Conservancy, is conducting a research project to quantify the effects of anthropogenic habitat degradation and restoration on stream insects in the Tahoe basin. The results of the study will provide necessary information for adaptive management land use decisions and for determining the feasibility of using benthic macroinvertebrates as biological indicators in sub-alpine streams.

Some industries, such timber harvesting, have also discovered the utility of bioassessments and began using them to monitor their impacts on the environment. For example, Scotia Pacific Company has been conducting extensive bioassessments over several years as part of their Habitat Conservation Plan requirements.